Agency for Healthcare Research and Quality
Advancing Excellence in Health Care

NATIONAL QUALITY MEASURES CLEARINGHOUSE

General

Title

Asthma admission: percentage of admissions with a principal diagnosis of asthma per 100,000 population, ages 2 through 17 years.

Source(s)

AHRQ QI research version 5.0. Pediatric quality indicator 14 technical specifications: asthma admission rate. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); 2015 Mar. 3 p.

National Quality Forum measure information: asthma admission rate (PDI 14). Washington (DC): National Quality Forum (NQF); 2014 Sep 18. 15 p.

Measure Domain

Primary Measure Domain

Related Population Health Measures: Population Use of Services

Secondary Measure Domain

Does not apply to this measure

Brief Abstract

Description

This measure is used to assess the percentage of admissions with a principal diagnosis of asthma per 100,000 population, ages 2 through 17 years.

Rationale

Hospital admission for childhood asthma often represents a failure to diagnose and proactively manage asthma in the home and at school through education, early detection and preventive medicine. Structures and processes of care associated with lower hospitalization rates in children for asthma include: compliance with evidence-based interventions aimed at the control of chronic asthma symptoms, the delivery of quality outpatient healthcare, and the control of asthma triggers (such as cigarette smoke

followed by dust in the home, pet dander, and preventable exposures to other children with upper respiratory infections). Important to this issue is patient/family education. Follow-up clinical care is a key because it provides opportunities to address variations in patients' symptoms and severity, exposure to allergens, adherence, the management plan, and patient self-management. Poor compliance to follow-up visits (including either delays or no follow-up care) not only has a negative impact on pediatric admissions for asthma but also impacts overall quality of life for both the patient and family.

Many parents and patients lack the information they need to manage chronic asthma symptoms and to prevent unnecessary hospitalizations for pediatric asthma. Common problems with adherence include: lack or delay in symptom recognition and action, medications not being given soon enough, running out of medications, refills not being called in to pharmacies, and failure to avoid known triggers of the child's asthma exacerbations, including exposure to cigarette smoke. An essential component of preventing asthma exacerbations includes controlling asthma triggers. Trigger reduction is a particularly high priority for preventing hospitalizations in poor inner-city children with asthma. Studies have found that among low-income urban households with a child with asthma, 47% to 50% have smokers in the home, 34% have furry pets, and 47% to 58% have high levels of cockroach allergen. Although many parents are aware of asthma triggers, more than half of environmental actions by parents do not meet current guidelines and are unlikely to control triggers effectively. Home health evaluation, smoking cessation counseling, and working closely with patients and families either during an acute hospitalization or in the outpatient arena can help to lower environmental triggers.

In addition, clinical practice guidelines suggest that asthma can be managed in the home or outpatient setting; thus hospitalizations for asthma are preventable.

This measure is an avoidable hospitalization/ambulatory care sensitive condition (ACSC) type indicator. ACSC type indicators are not measures of hospital quality, but rather measures of potentially avoidable hospitalization if appropriate outpatient care, other healthcare services or community services were accessed and obtained (i.e., measures of the health care system broadly defined). These measures are designed to assess population access to timely, high quality outpatient and public health services in a particular geographic area, for the purpose of managing chronic disease or diagnosing acute illnesses before progressing to inpatient treatment. These measures are of most interest to comprehensive health care delivery systems, such as some health maintenance organizations (HMOs), accountable care organizations (ACOs) or public health agencies. ACSC indicators correlate with each other and they may be used in conjunction as an overall examination of outpatient care and access to care at a national, regional or county level.

The improvement in the measure equates to less hospitalizations for pediatric asthma. This result essentially means the population is experiencing greater control and better management of their asthma given the reduction in the rate acute asthma events.

Evidence for Rationale

National Quality Forum measure information: asthma admission rate (PDI 14). Washington (DC): National Quality Forum (NQF); 2014 Sep 18. 15 p.

Primary Health Components

Pediatrics; asthma; ambulatory care sensitive condition (ACSC)

Denominator Description

Population ages 2 through 17 years in metropolitan area or county (see the related "Denominator Inclusions/Exclusions" field)

Numerator Description

Discharges, for patients ages 2 through 17 years, with a principal International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) diagnosis code for asthma (see the related "Numerator Inclusions/Exclusions" field)

Evidence Supporting the Measure

Type of Evidence Supporting the Criterion of Quality for the Measure

A clinical practice guideline or other peer-reviewed synthesis of the clinical research evidence

One or more research studies published in a National Library of Medicine (NLM) indexed, peer-reviewed journal

Additional Information Supporting Need for the Measure

Asthma is the most common chronic childhood illness, as well as a leading cause of childhood morbidity and one of the most common reasons for hospitalization in children (Centers for Disease Control and Prevention [CDC], n.d.; Akinbami & Schoendorf, 2002; Fuhlbrigge et al., 2002; Stranges, Merrill, & Steiner, 2008). In 2006, nearly 10% of children in the United States (U.S.) had a current diagnosis of asthma and 14% had a diagnosis at some point in their lives (Stranges, Merrill, & Steiner, 2008). There were approximately 335,000 asthma-related hospitalizations among children in the U.S. in 2006, comprising 13.6% of all pediatric hospitalizations, representing is a significant health care expenditure (Stranges, Merrill, & Steiner, 2008). Despite availability of asthma guidelines, quality of care provided to children hospitalized for asthma is suboptimal, especially with regard to initiation of chronic asthma control and prevention of asthma readmissions (Nkoy et al., 2008; Friday et al., 1997; Kattan, 2008; Cabana et al., 2003). Six-month hospital readmission rates for subsequent asthma attacks are reportedly as high as 40% (Minkovitz, Andrews, & Serwint, 1999; Farber, 1998).

Asthma disproportionately affects low-income and minority children. A study using the Agency for Healthcare Research and Quality (AHRQ) Pediatric Quality Indicator (PDI) for asthma hospitalizations and 2001 to 2004 Healthcare Cost and Utilization Project (HCUP) data reported hospitalization rates per 100,000 children aged 2 to 17 years varied by state ranging from 51.1 to 185.9 in the six geographically and diverse states studied (Knudson et al., 2009). Within these 6 states, authors reported that although rural children were the found to be most likely to be hospitalized for asthma, after controlling for rurality, poverty, uninsurance, and physician supply, uninsurance was the only variable to significantly impact hospitalization rates (Knudson et al., 2009). In addition, regional variation exists in the rate of hospitalizations for pediatric asthma with the Northeast being significantly higher than the West in 2011 (149.9 per 100,000 population vs 55.9 per 100,000 population, p less than .0001). Various explanations have been hypothesized for this variation, including differences in physician training, differences in practices, higher penetration of large managed care organizations or organizations that have implemented aggressive chronic disease management programs, and differences in environmental triggers.

Other studies report higher prevalence and hospitalization rates among minority children, especially those of low socioeconomic status in urban areas (Akinbami et al., 2009; Akinbami & CDC National Center for Health Statistics, 2006; Akinbami, Moorman, & Liu, 2011; Ernst et al., 1995; Gold & Wright, 2005; Lang & Polansky, 1994; Litonjua et al., 1999; Miller, 2000; Myers, 2000; Akinbami & Schoendorf, 2002; Nicholas et al., 2005; Stranges, Merrill, & Steiner, 2008; Hill, Graham, & Divgi, 2011; Berdahl et al., 2010). For example, a study using 2005 inpatient discharge data from the HCUP found that compared with white and Asian Pacific Islander children, black and Hispanic children were more likely to have admissions for asthma (331.394 and 138.620 per 100,000 2- to 17-year-olds, respectively vs. 91.175 and 63.705 per

100,000 2- to 17-year-olds, respectively). Black children had at least 3 times the rate of asthma admissions than white children from every income group (Berdahl et al., 2010).

Universal health insurance coverage does not completely address the issue of disparities, as one study of Department of Defense dependents enrolled in TRICARE found that black children in all age groups and Hispanic children ages 5 to 10 years were significantly more likely to have an a potentially avoidable asthma hospitalization or emergency department visit (OR=1.24 to 1.99) than white children (Stewart et al., 2010). Further studies have focused on the interrelationship among hardship (caregivers looking for work, having no one to borrow money from, not owning a car or home and being single/never married), neighborhood characteristics, socioeconomic characteristics, insurance coverage and racial disparities as explanations for higher asthma readmission rates among a subgroup of the population (Beck et al., 2014; Liu & Pearlman, 2009). Others have pointed to significant environmental factors (pollution, tobacco exposure, housing quality) related to exacerbations of asthma as additional explanations for income and geographic disparities in hospitalizations (Shapiro & Stout, 2002; Kuo et al., 2012).

Evidence for Additional Information Supporting Need for the Measure

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prevalence, treatment, and outcomes of asthma among a diverse population of children with equal access to care: findings from a study in the military health system. Arch Pediatr Adolesc Med. 2010 Aug;164(8):720-6. PubMed

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Extent of Measure Testing

Reliability Testing

The developer's metric of reliability is the signal to noise ratio, which is the ratio of the between area variance (signal) to the within area variance (noise). The formula is signal / (signal + noise). There is an area-specific signal to noise ratio, which is used as an Empirical Bayes univariate shrinkage estimator. The overall signal to noise ratio is a weighted average of the area-specific signal-to-noise ratio, where the weight is [1 / (signal + noise)^2]. The signal is calculated using an iterative method. The analysis reports the reliability of the risk-adjusted rate (before applying the empirical Bayes univirate shrinkage estimator).

Overall the risk-adjusted rate is strongly reliable. Based on a norm of a signal-to-noise ratio of 0.80, 80% of areas exceed the norm. Reliability is less than the norm in areas with population less than approximately 600 persons, meaning that the performance score is reliability adjusted closer to the shrinkage target in those areas.

Validity Testing

The developer conducted construct validity testing to examine the association between the risk-adjusted rate and area structural characteristics potentially associated with quality of care, including prior performance, using regression analysis. Two area structural constructs (Access to health care and Market competition) were derived from a principal components factor analysis using data from the Area Health Resource File (AHRF) 2012 to 2013. The following five variables were examined in the factor analysis: physician density defined as the number of physicians in patient care per person, excess capacity defined as percent of available short-term general hospital beds per total beds, poverty status defined as the percent of persons in poverty, insurance status defined as the percent of persons (under 65) without health insurance and population density per square mile. Access to health care is primarily defined by insurance status and poverty, followed by lower physician density and higher excess capacity, which is consistent with the hypothesis that lower physician density and excess capacity would increase utilization. The second factor, market competition, is primarily defined by poverty and higher physician density, followed by higher population density.

Given the stated rationale, the expectation for the regression analysis given the expected relationship between the "Less Access to High Quality Outpatient Care" construct validity measure (F1) and the area risk-adjusted rate is a positive, statistically significant coefficient. The expectation for the regression analysis given the expected relationship between the "More Market Competition" construct validity measure (F2) and the area risk-adjusted rate is a positive, statistically significant coefficient. The results are consistent with expectations. Also, past performance is a moderate predictor of current performance with a coefficient of 0.72.

Refer to the original measure documentation for additional measure testing information.

Evidence for Extent of Measure Testing

National Quality Forum measure information: asthma admission rate (PDI 14). Washington (DC): National Quality Forum (NQF); 2014 Sep 18. 15 p.

State of Use of the Measure

State of Use

Current routine use

Current Use

not defined yet

Application of the Measure in its Current Use

Measurement Setting

Ambulatory/Office-based Care

Hospital Inpatient

Professionals Involved in Delivery of Health Services

not defined yet

Least Aggregated Level of Services Delivery Addressed

Regional, County or City

Statement of Acceptable Minimum Sample Size

Does not apply to this measure

Target Population Age

Ages 2 to 17 years

Target Population Gender

Either male or female

National Framework for Public Health Quality

Public Health Aims for Quality

Population-centered

Risk Reducing

Vigilant

National Strategy for Quality Improvement in Health Care

National Quality Strategy Priority

Institute of Medicine (IOM) National Health Care Quality Report Categories

IOM Care Need

Not within an IOM Care Need

IOM Domain

Not within an IOM Domain

Data Collection for the Measure

Case Finding Period

Time window can be determined by user, but is generally one year.

Denominator Sampling Frame

Geographically defined

Denominator (Index) Event or Characteristic

Geographic Location

Patient/Individual (Consumer) Characteristic

Denominator Time Window

not defined yet

Denominator Inclusions/Exclusions

Inclusions
Population ages 2 through 17 years in the metropolitan area (MA) or county. Discharges in the numerator are assigned to the denominator based on the MA or county of the patient residence, not the MA or county of the hospital where the discharge occurred.

Note: The term "MA" was adopted by the United States (U.S.) Census in 1990 and referred collectively to metropolitan statistical areas (MSAs), consolidated metropolitan statistical areas (CMSAs), and primary metropolitan statistical areas (PMSAs). In addition, "area" could refer to either 1) Federal Information Processing Standard (FIPS) county, 2) modified FIPS county, 3) 1999 Office of Management and Budget (OMB) Metropolitan Statistical Area, or 4) 2003 OMB Metropolitan Statistical Area. Micropolitan Statistical Areas are not used in the Quality Indicator (QI) software.

Exclusions
Unspecified

Exclusions/Exceptions

not defined yet

Numerator Inclusions/Exclusions

Inclusions
Discharges, for patients ages 2 through 17 years, with a principal International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) diagnosis code for asthma

Note: Refer to the original measure documentation for ICD-9-CM codes. See also the *Pediatric Quality Indicators Appendices*.

Exclusions
Exclude cases:

- With any-listed ICD-9-CM diagnosis codes for cystic fibrosis and anomalies of the respiratory system
- Transfer from a hospital (different facility)
- Transfer from a Skilled Nursing Facility (SNF) or Intermediate Care Facility (ICF)
- Transfer from another health care facility
- Major Diagnostic Categories (MDC) 14 (pregnancy, childbirth, and puerperium)
- With missing gender (SEX=missing), age (AGE=missing), quarter (DQTR=missing), year (YEAR=missing), principal diagnosis (DX1=missing), or county (PSTCO=missing)

Numerator Search Strategy

Institutionalization

Data Source

Administrative clinical data

Type of Health State

Proxy for Health State

Instruments Used and/or Associated with the Measure

Unspecified

Computation of the Measure

Measure Specifies Disaggregation

Does not apply to this measure

Scoring

Rate/Proportion

Interpretation of Score

Does not apply to this measure (i.e., there is no pre-defined preference for the measure score)

Allowance for Patient or Population Factors

not defined yet

Description of Allowance for Patient or Population Factors

The predicted value for each case is computed using a hierarchical model (logistic regression with area random effect) and covariates for gender and age (in age groups). The reference population used in the regression is the universe of discharges for states that participate in the Healthcare Cost and Utilization Project (HCUP) State Inpatient Data (SID) for the year 2010 (combined), a database consisting of 44 states and approximately 5 million pediatric discharges, and the United States (U.S.) Census data by county. The expected rate is computed as the sum of the predicted value for each case divided by the number of cases for the unit of analysis of interest (i.e., area). The risk adjusted rate is computed using indirect standardization as the observed rate divided by the expected rate, multiplied by the reference population.

Additional information on methodology can be found in the *Empirical Methods* document on the Agency for Healthcare Research and Quality (AHRQ) Quality Indicator Web site and in the supplemental information.

Refer to the original measure documentation for the specific covariates for this measure.

Standard of Comparison

not defined yet

Identifying Information

Original Title

PDI 14: asthma admission rate.

Measure Collection Name

Agency for Healthcare Research and Quality (AHRQ) Quality Indicators

Measure Set Name

Pediatric Quality Indicators

Submitter

Agency for Healthcare Research and Quality - Federal Government Agency [U.S.]

Developer

Agency for Healthcare Research and Quality - Federal Government Agency [U.S.]

Funding Source(s)

Agency for Healthcare Research and Quality (AHRQ)

Composition of the Group that Developed the Measure

The Agency for Healthcare Research and Quality (AHRQ) Quality Indicator (QI) measures are developed by a team of clinical and measurement experts in collaboration with AHRQ. The AHRQ QIs are continually updated as a result of new research evidence and validation efforts, user feedback, guidance from the National Quality Forum (NQF), and general advances in the science of quality measurement.

Financial Disclosures/Other Potential Conflicts of Interest

None

Endorser

National Quality Forum - None

NQF Number

not defined yet

Date of Endorsement

2014 Sep 18

Adaptation

This measure was not adapted from another source.

Date of Most Current Version in NQMC

2015 Mar

Measure Maintenance

Measure is reviewed and updated on a yearly basis

Date of Next Anticipated Revision

Spring 2016 (version 6.0, including International Classification of Diseases, Tenth Revision, Clinical Modification [ICD-10-CM] and International Classification of Diseases, Tenth Revision, Procedure Coding System [ICD-10-PCS] compatible software)

Measure Status

This is the current release of the measure.

This measure updates previous versions:

AHRQ QI. Pediatric quality indicators #14: technical specifications. Asthma admission rate [version 4.4]. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); 2012 Mar. 2 p.
AHRQ quality indicators. Pediatric quality indicators: technical specifications [version 4.4]. Appendices. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); 2012 Mar. 61 p.

Measure Availability

Source available from the Agency for Healthcare Research and Quality (AHRQ) Quality Indicators (QI) Web site.

For more information, contact the AHRQ QI Support Team at E-mail: QIsupport@ahrq.hhs.gov; Phone: 301-427-1949.

Companion Documents

The following are available:

AHRQ quality indicators. Pediatric quality indicators (PDI) parameter estimates [version 5.0]. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); 2015 Mar. 98 p. This document is available from the AHRQ Quality Indicators Web site.
ARHQ quality indicators. Pediatric quality indicators benchmark data tables [version 5.0]. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); 2015 Mar. 13 p. This document is available from the AHRQ Quality Indicators Web site
AHRQ quality indicators. Pediatric quality indicators composite measure workgroup. Final report. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); 2008 Mar. various p. This document is available in PDF from the AHRQ Quality Indicators Web site.
HCUPnet: a tool for identifying, tracking, and analyzing national hospital statistics. [Web site]. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); [accessed 2015 Sep 10]. HCUPnet is available from the AHRQ Web site.

NQMC Status

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Copyright Statement

Production

Source(s)

AHRQ QI research version 5.0. Pediatric quality indicator 14 technical specifications: asthma admission rate. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); 2015 Mar. 3 p.

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